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Chester

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[54] **COMPOSITION OF A CONDUCTIVE CERAMIC GLAZE AND IMPROVED METHOD OF FORMING SAME**

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[58] **Field of Search** 252/519, 518, 521; 106/38.27, 38.3, 38.9, 48; 427/126.2, 126.3, 126.6, 133

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[57] **ABSTRACT**

A composition of matter utilized by particular method for forming an electrically conductive glaze upon the outer surface of a ceramic mold form wherein the combination includes approximately 33 percent soda feldspar, approximately 20 percent flint, approximately 9 percent calcium carbonate, approximately 1 to 2 percent ball clay, approximately 2 percent kaolin, approximately 7 percent zinc oxide and approximately 27 percent black iron oxide, all percentages being taken by weight, the method including the addition of an amount of flocculant such as 20 percent magnesium sulfate solution or deflocculant such as sodium tetrapyrophosphate or sodium silicate to control the viscosity of the solution and thereby control the thickness of the layer formed upon the external surface of the ceramic mold form, including the spraying or dipping of the mold form in the resulting solution for coating thereof as well as the firing of the coated ceramic mold form in a furnace or approximately 2200 to 2300 degrees Fahrenheit for approximately a 30 hour cycle.

20 Claims, No Drawings

COMPOSITION OF A CONDUCTIVE CERAMIC GLAZE AND IMPROVED METHOD OF FORMING SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

Ceramic molds are usually used as the form about which the rubber is placed for making high quality rubber gloves. The present composition is usable as a glaze about the external surface of such a ceramic mold which glaze itself is electrically conductive to facilitate the monitoring for imperfections of the gloves formed thereon. Also the conductive surface serves to increase the flow of heat to the glove to facilitate curing thereof. Preferably the conductive glaze is of a black coloration to enhance thermal retention characteristics of the mold form.

In practice a glove will be formed about a ceramic mold having the conductive glaze of the present invention therearound. Prior to removal of the glove from the form, the composite unit may be dipped in an electrolytic solution so that the conductive glaze itself will act as one electrode and another electrode may be placed in the electrolyte. In another method the glove need not be dipped in an electrolytic solution, but an electrode may be manually or otherwise caused to pass over the surface of the glove and visual arcing of a surge reading on a voltage or current meter will indicate an imperfection. In either system application of a voltage difference across the two electrodes will cause electrical current to flow between the electrodes only if an imperfection exists in the wall of the gloves at any point such that electric current may flow therethrough. However, if the glove is without imperfections the flow of current between the electrodes will be prevented. In this manner a glove can be tested for imperfections in a one-step process without requiring the removal of the glove from the mold form or the placing of the glove in a special test apparatus.

2. Description of the Prior Art

In the prior art the primary difficulty in the forming of electrically conductive glazes for ceramic mold forms was the lack of repetitive consistency of resistivity between one fired glaze and the next fired glaze. It is desirable to use a ceramic glaze having repeatably consistent surface resistivity. The prior art conductive glazes did not have this quality but the improved composition of the glaze as disclosed and claimed in the present invention provides a more repetitive consistency in surface resistivity than possible with any prior art compositions.

Particularly, the components of the glaze of the present invention are reasonably inexpensive as well as being very accessible.

Most prior art conductive surfaces on molds are achieved by using electrically conductive coatings rather than using the ceramic itself as the conducting agent. Conductive coatings tend to wear off quickly when not using the present invention but a conductive ceramic glaze has a very extended useful lifetime.

SUMMARY OF THE INVENTION

The present invention provides an improved composition for forming an electrically conductive glaze on the external surface of a ceramic mold form. The main components of the glaze include approximately by weight 33 percent feldspar, 20 percent flint, 9 percent calcium carbonate, 1–2 percent ball clay, 2 percent kaolin, 7 percent zinc oxide and 27 percent black iron oxide.

This overall glazing composition is added to water in an approximate ratio of 5 parts of the original composition to 4 parts water, or an amount of water is added to cause the resulting solution to assume a specific gravity of approximately 1.57 preferably, or at least within the range of 1.52 to 1.62.

The feldspar should be a soda feldspar and the flint should be filtered through a #325 mesh filter. This entire composition is then screened by an electric shaker through a #150 mesh filter followed by an amount of flocculent such as magnesium sulfate 20 percent solution for adjusting or the viscosity of the final dipping solution. The magnesium sulfate solution is operable to allow the smooth application of the glazing formula to the external surface of the mold form. If necessary a deflocculent can also be utilized to control viscosity.

This coated mold form is now placed in a furnace for firing at a maximum temperature of approximately 2200 to 2300 degrees for a 30 hour cycle to form a black semi-gloss electrically conductive glaze on the external surface of the mold. This composition and method is reproducible to consistently provide a surface resistivity of 50,000 to 150,000 ohms when measured at points 1 and 2 inches apart.

It is the preferred embodiment of the present invention to provide a ceramic mold form having an electrically conductive glaze about the external surface thereof.

It is an object of the present invention to provide an improved electrically conductive glaze upon the surface of a ceramic mold which is reproducible such that the glaze has a surface resistivity of 50,000 to 150,000 ohms when measured at points 1 to 2 inches apart.

It is an object of the present invention to provide an improved electrically conductive glazing composition which assumes a black semi-gloss finish after firing.

It is an object of the present invention to provide an improved composition for forming an electrically conductive glaze upon the external surface of a ceramic mold form which composition has an adjustable viscosity controllable by the addition of an amount of flocculent or deflocculent to assure smooth flow during application of the glazing material upon the mold form prior to firing.

It is an object of the present invention to provide an improved solution for forming an improved electrically conductive glaze upon a ceramic mold wherein the thickness of the formed glaze is controlled by the adjusting of the specific gravity of the glazing solution.

It is an object of the present invention to provide an improved electrically conductive composition for glazing a ceramic mold form wherein the specific gravity is adjusted by controlling closely the amount of water added thereto prior to coating of the mold form.

It is an object of the present invention to provide a method for glazing a ceramic mold form including the firing of the coated mold form in a conveniently reproduceable manner to provide a consistently reproduceable surface resistance of the resulting conductive glaze.

It is an object of the present invention to provide an improved composition and method for forming an electrically conductive glaze on the external surface of a ceramic mold form which is usable with a variety of sizes of mold forms.

It is an object of the present invention to provide an electrically conductive glaze upon a ceramic mold form which is capable of being produced for reasonably low cost.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

While the invention is particularly pointed out and distinctly claimed in the concluding portions herein, a preferred embodiment is set forth in this detailed description.

The purpose of the composition and method of the present invention is to provide a composition for forming an electrically conductive glaze upon the external surface of a ceramic mold form having a surface resistivity of approximately 50,000 to 150,000 ohms when measured at points 1 and 2 inches apart and which is easily reproducible within these tolerances. The preferred embodiment set forth in this detailed description provides a total material having a weight of 20 pounds and one half ounce. This material, including soda feldspar, flint, calcium, carbonate, ball clay, kaolin, zinc oxide and black iron oxide, is added to approximately 7000 ccs. of warm-to-hot water such that the specific gravity of the resulting solution is approximately 1.57. This solution is then adjusted for viscosity by the addition of an amount of flocculent such as magnesium sulphate 20 percent solution. Alternatively, if needed the addition of a deflocculent such as sodium tetrapyrophosphate or solium solicate could be added. Then the ceramic mold itself is coated and fired in order to form the final electrically conductive glaze thereon.

Initially each of the ingredients listed below is weighed. The specifics of each of the seven components of the original material are listed in the below table:

MATERIAL	LBS.	OZS.	PERCENTAGE	PERCENTAGE TOLERANCES BY WEIGHT
Feldspar (Soda)	6	10	33.0	30.0–35.0
Flint (325 Mesh)	4	1	20.2	18.0–22.0
Calcium Carbonate	1	13	9.2	7.0–11.0
Ball Clay (English)	0	3½	1.1	1.0–2.0
Kaolin	0	7	2.2	2.0–4.2
Zinc Oxide	1	7	7.3	5.0–10.0
Black Iron Oxide	5	7	27.0	25.0–30.0
	20	½	100.0	

Each of the seven material listed above is initially independently weighed. The black iron oxide is held separately and the remaining six ingredients are physically mixed. Initially the iron oxide is added to at least a portion of the 7000 ccs. of water and mixed. The mixing may be performed by stirring on an electric mixer for approximately 10 minutes or possible ball milling for up to 3 hours. The remaining six ingredients are then added and the entire composition is stirred for one-half hour. Additional water is now added to bring the specific gravity within the limitations of 1.52 to 1.62 but most preferably to approximately 1.57. The exact amount of water finally added can vary within the tolerances and in this manner the final thickness of the coating of material upon the external surface of the ceramic mold is controlled. With a higher specific gravity the coating will be thicker whereas with a lower specific gravity the coating will be thinner. This adjustment can be made with each run as desired in order to vary the thickness of the final conductive glaze.

This solution now having the desired specific gravity may be screened through a #150 mesh on a shaker such as an electric shaker or the like. Then the viscosity of the solution is adjusted to assure a smooth application flow during dipping or spraying by the addition of an amount of magnesium sulphate 20 percent solution which acts as a flocculent. This solution is added sparingly since a few drops will change the viscosity substantially due to chemical reaction with the material. However, should deflocculent be needed then a small amount of sodium tetrapyrophosphate or sodium silicate may be added.

The now properly dipped or sprayed, wet ceramic mold form will be placed within a furnace for firing. Preferably the firing will be performed in an oxidizing environment wherein the temperature is raised to approximately 2260 degrees Fahrenheit and then down to room temperature over a 30 hour cycle. This will result in a black semi-gloss finish being assumed by the electrically conductive glaze as well as a surface resistivity in the range of 50,000 to 150,000 ohms when measured at points 1 and 2 inches apart.

One of the primary advantages of the present invention is the ability to consistently produce electrically conductive glazes having surface resistivity more closely held within the above-defined tolerances. As long as each of the materials is included within the percentage ranges claimed and disclosed in this invention this surface resistivity will be maintained within the described limit. Thus a consistency of resistivity in the resulting glaze is achieved by using the composition disclosed and claimed in the present invention as well as the method disclosed and claimed herein.

While particular embodiments of this invention have been shown in the drawings and described above, it will be apparent, that many changes may be made in the form, arrangement and positioning of the various elements of the combination. In consideration thereof it should be understood that preferred embodiments of this invention disclosed herein are intended to be illustrative only and not intended to limit the scope of the invention.

I claim:

1. An improved electrically conductive composition for glazing a ceramic mold form including a first combination comprising:
(a) feldspar: 30.0–35.0 percent by weight;
(b) flint: 18.0–22.0 percent by weight;
(c) calcium carbonate: 7.0–11.0 percent by weight:
(d) ball clay: 1.0–2.0 percent by weight
(e) kaolin: 2.0–4.2 percent by weight;
(f) zinc oxide: 5.0–10.0 by weight
(g) black iron oxide: 25.0–30.0 by weight

2. The composition as defined in claim 1 wherein said feldspar is a soda feldspar.

3. The composition as defined in claim 1 wherein said flint has been filtered through a #325 mesh filter.

4. The composition as defined in claim 1 further including water added thereto.

5. The composition as defined in claim 4 wherein three to five parts of water by weight is included for each five parts of said first combination.

6. The combination as defined in claim 4 wherein approximately four parts of water by weight is included for each five parts by weight of said first combination.

7. The composition as defined in claim 6 further including the addition of an amount of flocculent to achieve desired viscosity.

8. The composition as defined in claim 7 wherein said flocculent is a 20% solution of magnesium sulphate.

9. The composition as defined in claim 6 further including the addition of an amount of deflocculent.

10. The composition as defined in claim 9 wherein said deflocculent is sodium tetrapyrophosphate.

11. The composition as defined in claim 9 wherein said deflocculent is sodium silicate.

12. An electrically conductive composition for glazing a ceramic mold form comprising:

(a) a first combination including:
   (1) soda feldspar: 30.0–35.0 percent by weight;
   (2) flint (filtered through #325 mesh): 18.0–22.0 percent by weight;
   (3) calcium carbonate: 7.0–11.0 percent by weight;
   (4) ball clay: 1.0–2.0 percent by weight:
   (5) kaolin: 2.0–4.2 percent by weight;
   (6) zinc oxide: 5.0–10.0 by weight;
   (7) black iron oxide: 25.0–30.0 by weight; and
(b) water added in an amount equal to between 60 and 100 percent by weight of said first combination.

13. The composition as defined in claim 2 further including the addition of an amount of flocculent to achieve a desired viscosity.

14. The composition as defined in claim 12 further including the addition of an amount of deflocculent to achieve a desired viscosity.

15. An improved method for forming an electrically conductive glaze upon a ceramic mold form comprising:

(a) forming a combination comprising feldspar (30.0–35.0 percent by weight), flint (18.0–22.0 percent by weight), calcium carbonate (7.0–11.0 percent by weight), ball clay (1.0–2.0 percent by weight), kaolin (2.0–4.2 percent by weight), zinc oxide (5.0–10.0 percent by weight), black iron oxide (25.0–30.0 percent by weight);
(b) forming a solution by mixing five parts by weight of said combination with from three to five parts water by weight;
(c) adjusting the viscosity of the solution as desired by adding an amount of flocculent or deflocculent thereto;
(d) applying the solution to the surface of a ceramic mold form; and
(e) heating the coated ceramic mold form to form an electrically conductive glaze thereon.

16. The method as defined in claim 15 wherein said mixing is performed with sufficient water to yield a resulting solution having a specific gravity of from 1.52–1.62.

17. The method as defined in claim 15 wherein the heating is performed by the temperature of approximately 2,260 degrees Fahrenheit for a cycle of approximately 30 hours.

18. The method as defined in claim 15 wherein the applying of the solution is performed by dipping of the ceramic mold form therein.

19. The method as defined in claim 15 wherein the applying of the solution is performed by spraying of the ceramic mold form therein.

20. The method as defined in claim 15 further including screening of the solution through a #150 mesh filter after adjusting the specific gravity and prior to the adjusting of the viscosity by adding of the 20 percent magnesium sulphate solution.

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